FIRST RECORD OF THE MELON-HEADED WHALE *PEPONOCEPHALA ELECTRA* FROM SOUTH AFRICA

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(With 7 figures and 4 tables)

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ABSTRACT

An adult male *Peponocephala electra* that stranded at Hout Bay (34°03′S 18°21′E) in July 1976 was the first record of the species from South Africa and the South Atlantic. Details of the animal's external appearance, body measurements, organ weights, parasites, stomach contents, skull measurements and skeletal characters are given. Differences in coloration and head and flipper shape between this species and *Feresa attenuata* are demonstrated.

CONTENTS

INTRODUCTION

At about 07h40 on 16 July 1976 a single small whale stranded alive on the beach at Hout Bay (34°03′S 18°21′E). It was placed in the water four times by the harbour master, but each time the animal returned to the beach. Finally it was taken to the harbour where it was placed in the water from a jetty, but the animal then stranded on a near-by slipway, where it died half an hour later (at about 10h00).

Later the same day the whale was examined by staff of the marine mammal laboratory of the Sea Fisheries Institute, and was found to be a melon-headed whale[1] (*Peponocephala electra*), the first such record for South Africa. A cast of the head was prepared and the whole skeleton was presented to the South African Museum (ZM 38245).

[1] As there appears to be no Afrikaans (or Dutch—Van Bree 1975) name for this species, the authors suggest 'bolkopdolfyn'.

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EXTERNAL APPEARANCE

The animal was a male, 248 cm long, and was generally undamaged apart from a few superficial cuts and abrasions caused by stranding. It was photographed about an hour after death, while the colour pattern was still rather prominent (Figs. 1–6).

The general body coloration was bluish-black overall (Fig. 1). Both upper and lower jaws, however, were irregularly edged with white as far back as the angle of the gape (Fig. 2). On the belly of the animal there was also a greyish-white 'blaze' in the midline extending from the throat to the anal slit (Fig. 3). The shape of this blaze was similar to the 'throat chevron-genital patch pattern' (Mitchell 1970) seen in pilot whales (especially *Globicephala melaena*), false killer whales (*Pseudorca crassidens*), pygmy killer whales (*Feresa attenuata*), and Risso's dolphins (*Grampus griseus*), particularly juveniles. On the throat this blaze was roughly bracket-shaped, rapidly narrowing posteriorly to a thin mid-ventral streak between the flippers. The blaze gradually widened on the abdomen to form a lozenge-shaped mark extending approximately from the umbilicus to the anus. Only at its posterior extremity (where the blaze formed a V terminating at the anterior end of the anal slit) were its outer margins well defined.

The animal had a healed scar roughly elliptical in outline under the left flipper (probably attributable to the small shark *Isistius* (Jones 1971)). The only other feature of the body coloration was a well-defined pale band on the dorsal midline of the head from the blowhole to the tip of the snout, which broadened anteriorly to cover most of the front of the head (Fig. 4). This band appears equivalent to the 'apex of melon to blowhole stripes' described by Mitchell (1970) for *Tursiops* and other species of delphinid cetaceans. It is just apparent in figures of *P. electra* provided by Nishiwaki & Norris (1966), being masked by highlights in most pictures, but has not been described previously for this species, nor for *F. attenuata*.

In other respects the animal was very similar in coloration to the pygmy killer whale. However it lacked the pale grey lateral coloration described for *F. attenuata* by Nishiwaki *et al.* (1965). As this feature fades rapidly after death, its absence on this *P. electra* carcass cannot be taken unequivocally as applying to the animal in life. Bryden *et al.* (1977*b*), however, assert that this coloration is not present in *Peponocephala*, and it could not be detected on a captive animal (seen by P.B.B.) at Sea Life Park, Hawaii, on 23 March 1980.

The dorsal fin of the Hout Bay specimen had presumably been damaged, as the trailing edge was ragged (Fig. 5).

The external measurements of the whale were taken as recommended by the Committee on Marine Mammals, American Society of Mammalogists (Norris 1961). As only ten specimens of this species appear to have been measured previously the data from all eleven animals (expressed as proportions of the total body length) are presented in Table 1. The specimen measured by

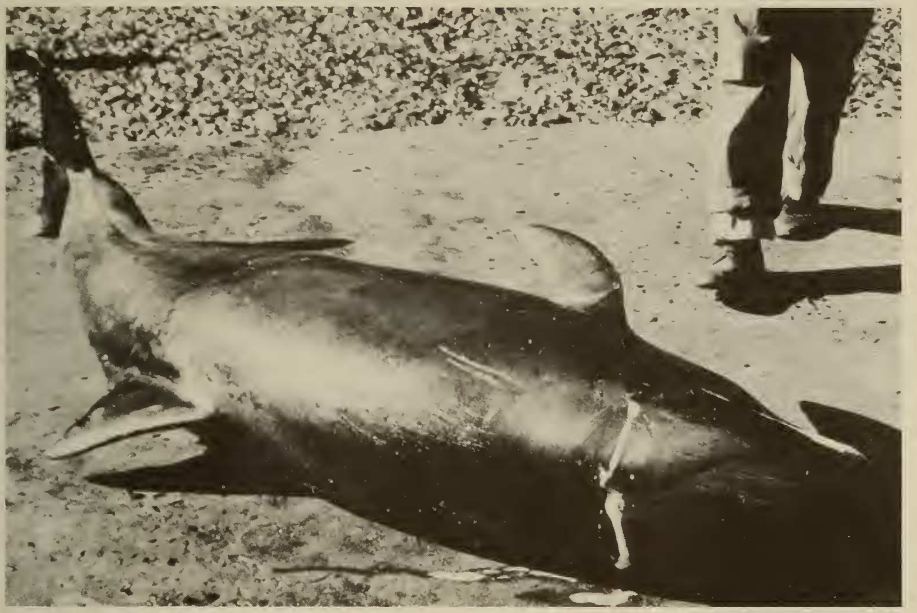

Fig. 1. General body coloration of the *Peponocephala electra* that stranded at Hout Bay.

Fig. 2. Head of the *Peponocephala electra* that stranded at Hout Bay showing white edging to the upper and lower jaws.

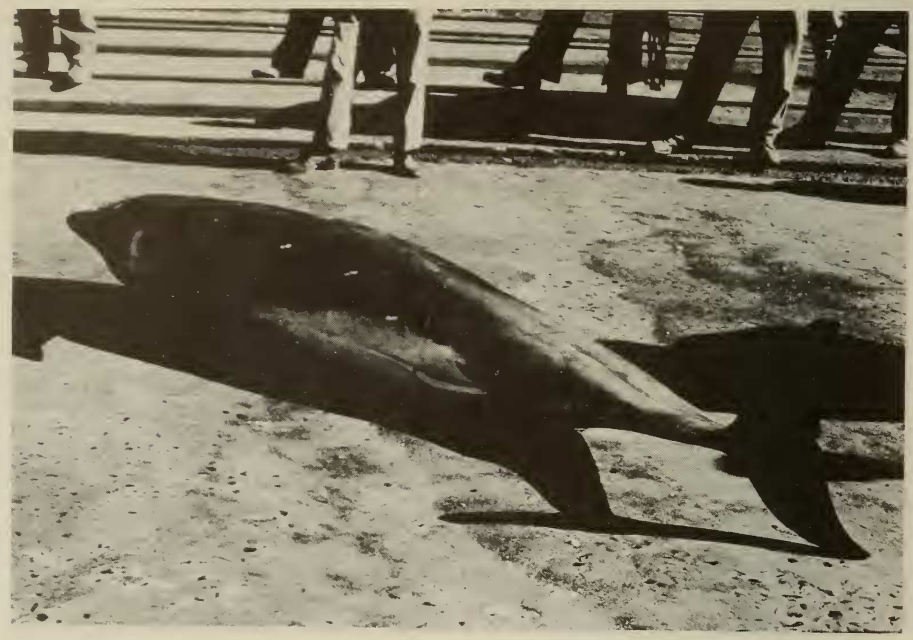

Fig. 3. Belly of the *Peponocephala electra* that stranded at Hout Bay showing a greyish-white 'blaze' along the midline.

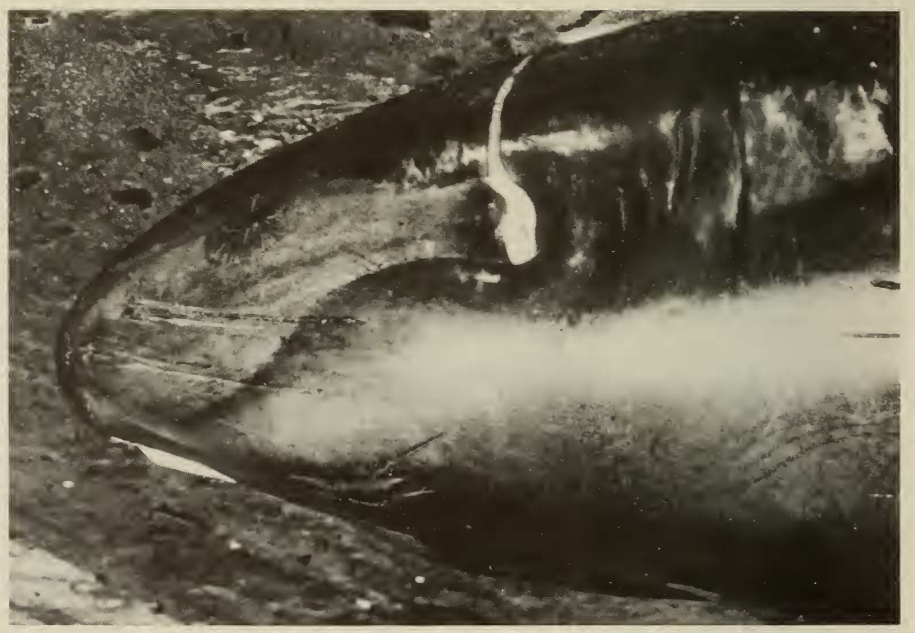

Fig. 4. Head of the *Peponocephala electra* that stranded at Hout Bay showing a pale band from the blowhole to the snout.

Fig. 5. Dorsal fin of the *Peponocephala electra* that stranded at Hout Bay.

Pilleri & Gihr (1973–4) was a mounted skin and hence the measurements may not be strictly comparable.

At least some of the measurements given for specimen C15 appear to be erroneous, particularly those concerning the position of the genital aperture and anus, which (although the animal was a male) are placed further posteriorly than in any of the females measured. The data for this animal have therefore been excluded from subsequent analyses. Although the remaining sample is small (six males, three females and one of unknown sex), a comparison between sexes of the proportional measurements indicates some apparent differences (apart from those concerned with the position of the anus and genital aperture). In males the anal girth appears larger (29,1–38,6% cf 26,1–28,8%), the flippers longer (17,5–20,4% cf 16,2–17,0%, or 13,0–15,8% cf 11,7–12,5%), the dorsal fin greater in height (8,4–10,9% cf 7,3–8,0%) and the tail flukes broader from the notch to their anterior margin (6,1–7,2% cf 5,1–5,5%) than in females. These apparent differences cannot all be accepted as evidence of sexual dimorphism until ontogenetic changes in body proportions of *P. electra* have been investigated: the present sample is too small for such an analysis, but it may be significant that only one of the three females was sexually mature, while four of the six males could be classified as mature (Bryden *et al.* 1977*b*). Differences in the anal girth may reflect the more anterior position of the opening in males. Alternatively, they may be indicative of real

TABLE 1
Body measurements of *Peponocephala electra*.

Measurement	ZM 38245 (♂)		Males						Females			Unknown sex
			Japan[1]	AMNH 43000[2]	C2[3]	MM9[3]	C14[4]	C15[4]	C12[4]	C13[4]	C16[4]	Songkla[5]
	cm	%	%	%	%	%	%	%	%	%	%	%
Tip of upper jaw to deepest part of notch in flukes	248		(260)	(273)	(267,7)	(223)	(264)	(204,5)	(228,8)	(211,2)	(257)	(237)
		100	100	100	100	100	100	100	100	100	100	100
Tip of upper jaw to centre of anus	168	67,7	—	68,5	65,1	66,4	66,3	82,2	69,5	70,8	70,0	—
Tip of upper jaw to centre of genital aperture	144	58,1	—	55,9	54,7	57,0	56,8	76,3	66,0	67,5	66,5	—
Tip of upper jaw to tip of dorsal fin	138	55,6	—	—	62,8	60,1	60,2	72,9	58,0	57,3	56,4	—
Tip of upper jaw to ant. insertion of dorsal fin	106	42,7	—	43,2	—	—	—	—	—	—	—	40,5[6]
Tip of upper jaw to centre of umbilicus	118	47,6	—	—	43,5	—	39,8	50,9	47,3	53,0	46,7	—
Tip of upper jaw to ant. insertion of flipper	53	21,4	—	21,1	19,0	20,2	20,3	26,7	23,1	23,4	17,5	20,3
Tip of upper jaw to angle of gape	28	11,3	—	11,0	10,1	9,9	9,5	13,4	11,0	10,4	10,5	9,7[7]
Tip of upper jaw to centre of eye	36	14,5	12,9	13,6	13,6	13,5	13,4	17,7	14,9	14,4	13,7	12,7
Tip of upper jaw to blowhole	32	12,9	13,3	14,9	14,3	13,0	14,8	17,8	12,9	14,7	14,6	13,5
Tip of upper jaw to external auditory meatus	—	—	—	—	16,2	—	16,3	—	18,1	17,5	16,5	—
Girth, at axilla	139	56,0	—	—	50,4	54,3	58,7	66,0	47,8	49,5	57,6	—
Girth, maximum	147	59,3	—	—	51,8	57,8	65,2	66,0	49,8	50,8	58,8	—
Distance of maximum girth from tip of upper jaw	99	39,9	—	—	40,8	39,5	32,2	—	35,7	38,4	—	—
Girth, at anus	93,5	37,7	—	38,3	36,2	29,1	38,6	34,7	26,1	26,8	28,8	—
Girth, midway anus to notch in flukes	45,5	18,3	—	—	—	—	—	—	—	—	—	—
Height of body at same locality	40	16,1	—	—	—	—	—	—	—	—	—	—
Projection of upper jaw beyond lower	2,3	0,9	0,4	—	0,3	0,2	1,5	1,1	0,3	0,6	0,2	—
Centre of eye to angle of gape (direct)	7,5	3,0	—	—	3,1	3,8	3,6	4,7	3,7	4,1	3,7	—
Centre of eye to centre of blowhole (direct)	26	10,5	—	8,2	8,7	—	8,3	8,3	10,1	10,0	9,5	(L)7,2 (R)8,0
Blowhole, width	4,5	1,8	—	1,6	1,8	—	1,9	2,0	1,5	2,2	1,5	1,5
Blowhole, length	2,5	1,0	—	—	0,9	—	0,9	0,6	0,7	0,5	0,5	—
Eye, height	0,5	0,2	—	—	0,5	0,9	0,6	0,7	0,3	0,4	0,5	—
Eye, length	4	1,6	—	1,1	1,0	1,3	1,1	1,6	1,2	1,4	1,2	0,8
Genital slit, length	36	14,5	—	—	7,9	6,7	5,7	11,9	7,0	9,9	2,9	—
Anal slit, length	5,5	2,2	—	—	3,3	2,2	2,1	0,8	0,6	0,8	0,7	—
Flipper, length, ant. insertion to tip R	43,7	17,6	20,4[9]	18,1[8]	19,3[8]	17,9[8]	19,1[8]	22,2[8]	16,6[8]	16,2[8]	17,0[8]	—
L	43,5	17,5										
Flipper, length, axilla to tip R	33	13,3	15,8[10]	—	14,6[8]	13,0[8]	13,0[8]	16,6[8]	12,5[8]	11,7[8]	12,4[8]	14,4[11]
L	34,5	13,9										
Flipper, width, maximum R	13	5,2	6,2[8]	—	6,2[8]	4,9[8]	5,6[8]	6,2[8]	4,5[8]	4,4[8]	5,1[8]	5,1[8]
L	13,5	5,4										
Dorsal fin, height	22	8,9	9,6	8,4	10,9	9,0	9,7	8,3	7,3	7,7	8,0	8,4
Dorsal fin, length of base	52	21,0	15,4	16,1	17,1	14,8	16,3	16,4	14,4	10,4	10,5	11,4
Width of flukes, tip to tip	52	21,0	25,6	22,9	27,8	20,4	24,4	22,7	18,6	18,9	22,8	19,4[12]
Distance from nearest point on ant. border of flukes to notch R	16	6,5	—	—	6,6[8]	7,2[8]	6,1[8]	6,1[8]	5,2	5,1	5,5	—
L	16	6,5										
Depth of notch in flukes	3,5	1,4	—	1,4	1,8	5,8	1,3	2,1	1,4	1,6	1,1	—

[1] Nakajima & Nishiwaki (1965).
[2] Goodwin (1945).
[3] Bryden *et al.* (1977*a*).
[4] Bryden *et al.* (1977*b*).
[5] Pilleri & Gihr (1973–4).
[6] Presumably to anterior insertion, though this is not specified.
[7] 'Length of lips'.
[8] Side not specified.
[9] Radial length (side not specified).
[10] Ulnar length (side not specified).
[11] 'Length of flipper', side not specified.
[12] 'Tail fluke, width'.

sexual dimorphism. The largest male *P. electra* yet measured (273 cm long (Goodwin 1945)) had a pronounced protuberant keel posterior to the anus, similar to that seen in adult males of some stocks of delphinid species (e.g. eastern Pacific *Stenella longirostris* (Perrin 1972)). There is also a suggestion of a similar but smaller keel in the male 267,7 cm long illustrated by Bryden *et al.* (1977*a*). The apparently greater anal girth in male *P. electra* could reflect the development of this protuberant keel, if it should be found to be a consistent feature of the males of this species.

By comparison with the only species with which it is likely to be confused, *F. attenuata*, the melon-headed whale has a relatively longer head section. Measurements from the tip of the snout to the angle of gape, eye and blowhole as a proportion of the total body length are all greater in *P. electra* than in *F. attenuata* (Table 2). This distinction does not extend as far as the anterior insertion of the flipper, suggesting that the real difference between the two species lies in the length of the rostrum. No other distinctions in body proportions could be found between the two species.

TABLE 2

Comparison of body measurements (expressed as a proportion of body length) between *Peponocephala electra* and *Feresa attenuata*.

	P. electra[1]			*F. attenuata*[2]		
Measurement	n	mean	range	n	mean	range
Tip of snout to centre of eye . . .	10	13,7	12,7–14,9	19	10,1	8,1–12,0
Tip of snout to angle of gape . . .	9	10,4	9,7–11,3	17	6,9	5,4– 8,9[3]
Tip of snout to blowhole	10	13,9	12,9–14,9	19	9,8	6,7–11,9
Tip of snout to anterior insertion of flipper	9	20,7	17,5–23,4	18	19,8	16,8–22,6

[1] From Table 1 (C15 excluded).

[2] From Best (1970), Bryden (1976), Nishiwaki *et al.* (1965), Perrin & Hubbs (1969), and Pryor *et al.* (1965).

[3] Excluding a value of 11 per cent (Bryden 1976) which appears atypical as it places the angle of gape posterior to the blowhole, a situation not recorded in any of the other specimens measured to date.

From a photographic comparison, however, the flippers of *P. electra* (Fig. 6) appear to be more pointed at the tip and with a straighter trailing edge than those of *F. attenuata* (Best 1970; Bryden *et al.* 1977*a*; Nakajima & Nishiwaki 1965; Nishiwaki *et al.* 1965; Perrin 1976; Pilleri & Gihr 1973–4; Pryor *et al.* 1965; Rancurel 1974; Yamada 1954). This distinction has been noted by Bryden *et al.* (1977*b*), and may arise from differences in the arrangement of bones in the flipper (see below). To illustrate the distinction, outline drawings of flippers of *P. electra* and *F. attenuata* are shown in Figure 7.

LIFE HISTORY DATA

The animal weighed 206 kg entire on a platform scale, but its weight in parts totalled 209,8 kg (Table 3). As dissection of a large cetacean normally creates significant weight-loss (Lockyer 1976), one of the two weighings must

Fig. 6. Flipper of the *Peponocephala electra* that stranded at Hout Bay.

TABLE 3

Weight of *Peponocephala electra* in parts and weights of various organs.[1]

Part	Weight lb	kg	%
Blubber	97	(44,0)	21,0
Axial muscle, dorsal	91	(41,3)	19,7
ventral	52	(23,6)	11,2
Head[2]	65	(29,5)	14,1
Vertebral column (including tail)	46	(20,9)	9,9
Ribcage	46	(20,9)	9,9
Flippers & scapulae	18	(8,1)	3,9
Viscera	47,5	(21,5)	10,3
Total	462,5	(209,8)	100

Organ	kg
Heart (minus clots)	1,025
Lungs & trachea	5,245
Liver	3,310
Kidneys, left	0,575
right	0,560
Spleen	0,075
Intestines	3,750
Adrenals, left	0,0068
right	0,0092
Diaphragm	1,455
Oesophagus	0,360
Bladder	0,130
Stomach (plus contents)	2,455

[1] Parts were weighed on a spring balance graduated in pounds.
[2] Including associated blubber and muscle.

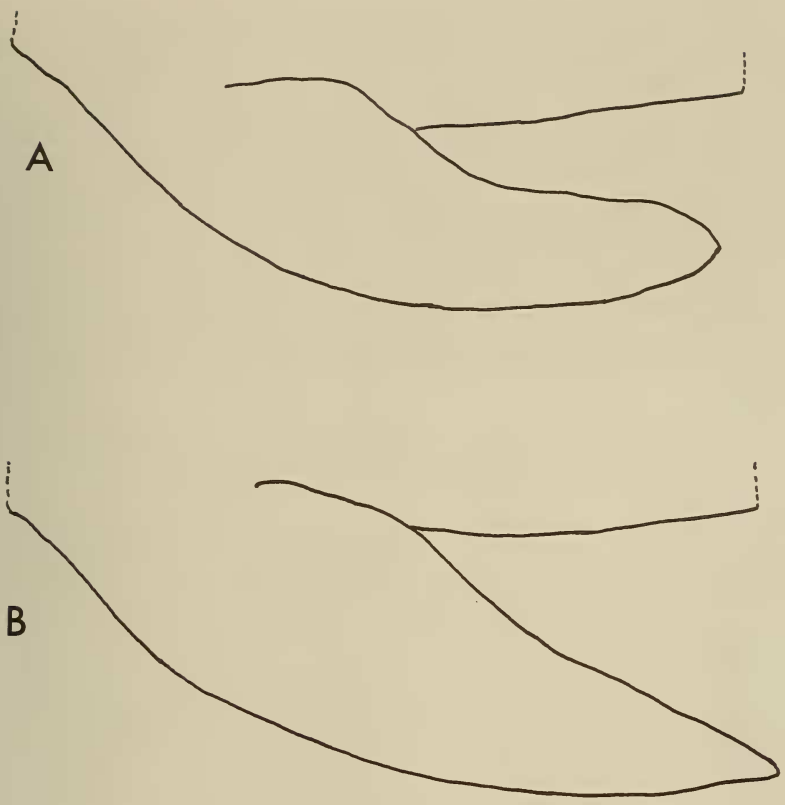

Fig. 7. Outlines of left flipper.
A. *Feresa attenuata* (from Nishiwaki *et al.* 1965).
B. *Peponocephala electra* (SAM–ZM38245).

be incorrect. The platform scale belonged to a commercial fishing company in Hout Bay and was regularly assayed, and hence its accuracy should perhaps be considered more reliable. Repeat weighings on this scale, however, produced differences of up to 2,5 kg depending on the position of the animal on the platform. The highest weight obtained (206 kg) has been adopted as the most accurate, given the apparent weight of the animal in parts.

This is the largest *P. electra* weighed to date. Bryden *et al.* (1977*b*) provided data for a foetus (3,9 kg) and three immature animals (78, 100 and 100 kg), while a calf from the eastern tropical Pacific Ocean weighed 15 kg (Perrin 1976).

No external parasites were found, despite an examination of the body surface, eye, blowhole, mouth, anal and genital slits, and appendages. 'Whale lice' (Miyazaki & Wada 1978) and traces of barnacle attachments on the tail flukes (Bryden *et al.* 1977*a*) have been recorded previously.

Numerous internal parasites were found. Longitudinal strips of blubber were cut transversely at 10 to 13 cm intervals, and the number of cestode cysts (probably *Phyllobothrium* sp.) counted. These totalled 58, ofwhich about 90 per cent were in the posterior half of the body. Cestode cysts (*Phyllobothrium chamissonii*) were also found in the abdomen grouped around the rectum (32), in the mesentery of the small intestine (2), in the diaphragm (2), and in the muscle (1). Nematodes (*Anisakis simplex*) were found in the oesophagus (36) and in the stomach (chiefly the second), where they weighed 20 g. The large and small intestines were opened for about 25 cm at 2 m intervals: one incomplete acanthocephalan (probably *Bolbosoma* sp.) was found in the rectum and 2 nematode fragments (probably *Anisakis simplex*) at about the midlength of the small intestine. Parasites were not found in the heart, liver, lungs, kidneys, or bladder.

Parasitic cysts in the blubber (unidentified) and *Phyllobothrium chamissonii* (= *Monorygma* sp.) cysts in the stomach wall or between the peritoneum and abdominal muscles in the inguinal region of *P. electra* have been recorded previously (Bryden *et al.* 1977*a*; Cannon 1977; Dailey & Brownell 1972). Nakajima & Nishiwaki (1965) reported the presence of unidentified stomach nematodes, while Cannon (1977) described *Anisakis simplex* and *A. typica* from the stomach of *P. electra*. Bryden *et al.* (1977*a*), Dawbin *et al.* (1970), and Nakajima & Nishiwaki (1965) all record the presence of small thread-like worms or nematodes in the air sinuses of the head, identified by Bryden *et al.* (1977*a*) as *Stenurus* sp. and by Cannon (1977) as *S. globiocephalae*. The air sinuses of the Hout Bay specimen were unfortunately not examined. Dailey & Brownell (1972) also list the trematode *Nasitrema* sp. and the nematode *Halocercus* sp. as 'new host records' for this species, without specifying the host tissue.

The stomach contained 2 upper beaks and 1 lower beak of *Loligo reynaudi* and 1 lower beak of a juvenile ommastrephid squid, a squid pen, 2 fish otoliths (*Merluccius* sp.) and some sand. There are no previously identified stomach contents for this species. As indicated by Leatherwood & Walker (1979), however, stomach contents of stranded cetaceans should be interpreted with a great deal of caution: in *Lissodelphis borealis* these authors found many near-shore fish species not representative of the normal known distribution of the dolphin and which were probably ingested just prior to stranding.

The faeces were bright green with much mucus, indicating that the animal was either sick or had not fed for some time (Ridgway 1972).

The testes (without epididymides) weighed 760 g (left) and 1 035 g (right), and measured 34 × 7,4 × 3,9 cm (left) and 38 × 8,8 × 4,6 cm (right). Bryden *et al.* (1977*b*) have summarized the known reproductive data for male *P. electra*, comprising a total of five animals. A male with a combined testis weight of 1 359 g was shown histologically to be sexually mature, so it is reasonable to assume that the Hout Bay animal was also mature.

SKELETON

The skull dimensions of the Hout Bay specimen were measured using a pair of 55 cm vernier calipers. To avoid ontogenetic differences, comparison with previously measured skulls (Table 4) has been confined to animals with a condylobasal length (CBL) exceeding 440 mm: this limit was chosen on the basis of the determination of skulls with a CBL of 415 mm as adolescent and a CBL of 456 mm as adult (Dawbin *et al.* 1970), and the description of a skull with a CBL of 440,2 mm as 'approaching adulthood' (Bryden *et al.* 1977*a*). The Hout Bay specimen could clearly be classified as adult from the robust rostrum, strongly developed supraoccipital crest, the degree of fusion of sutures, the advanced ossification of the mesethmoid, the degree of filling-in of the cranial hiatus and the posterior extension of the vomer in the basicranial trough (Dawbin *et al.* 1970).

TABLE 4

Skull measurements of *Peponocephala electra*

	ZM 38245		Previous records[1]	
	mm	% CBL	n	Range of % CBL
Condylobasal length	477	100	—	—
Rostrum length	258	54,1	12	52,3–55,6
Rostrum basal width	136	28,5	12	27,6–31,0
Rostrum width 60 mm ant. to antorbital notches	116	24,3	11	22,2–26,5
Rostrum width at middle	97	20,3	11	17,3–25,2
Premaxillae, width at same point	46	9,6	7	8,7–14,25
Tip of snout to blowhole	320	67,1	7	68,7–70,4
Tip of snout to pterygoid	300	62,9	5	62,5–66,5
Preorbital width	245	51,4	11	50,5–54,4
Postorbital width	263	55,1	12	53,6–57,6
Orbital width	249	52,2	7	51,3–54,6
Blowhole, width at	61	12,8	7	11,9–16,6
Zygomatic breadth	263	55,1	11	54,0–57,6
Greatest width of premaxillaries	101	21,2	12	19,9–23,6
Width of braincase across parietals	197	41,3	10	37,7–44,0
Length of upper toothrow L	186	39,0	11	36,6–40,7
R	184	38,6	11	35,3–40,9
Hinder edge of upper toothrow L to tip of premaxillae R	184	38,6	5	38,6–41,0
	185	38,8	5	37,5–41,2
Length of lower toothrow L	164	34,4	8	34,6–38,6
R	163	34,2	8	33,8–39,2
Hinder edge of lower tooth row to tip of mandible L	170	35,6	5	35,6–38,2
R	170	35,6	5	34,4–38,5
Mandible length	384	80,5	9	79,4–81,8
Coronoid height	95	19,9	9	17,7–20,5
Length of symphysis	38	8,0	7	6,7– 9,2
Post-temporal length	97[2]	20,3	10	17,1–21,0
Post-temporal height	62[2]	13,0	10	11,0–15,3
Width at ¾ rostrum length	72	15,1	5	14,7–16,9
Cranial height	154	32,3	6	28,5–40,4
Cranial length, internal	154	32,3	5	27,8–33,9[3]
Tooth count[4] RU	22		14	21–26
LU	21		14	20–25
RL	22		13	22–25
LL	22		13	22–25

[1] From Bryden *et al.* (1977*a*), Dawbin *et al.* (1970), and Van Bree & Cadenat (1968).
[2] Left side only.
[3] Plus one outlying value of 18,7 per cent (Bryden *et al.* 1977*a*).
[4] Count of alveoli.

Nearly all the skull dimensions (expressed as percentages of CBL) of the Hout Bay animal fall within the range previously recorded for 'adult' *P. electra*. One exception is the measurement tip of snout to blowhole, which appears shorter than any previously recorded. Comparison of the outline of the nares with figures provided by Dawbin *et al.* (1970) and by Van Bree & Cadenat (1968), however, suggest that either the Hout Bay specimen was atypical, or that the anterior margin of the nares was damaged. The dimensions of the tooth rows in general are close to or below the lower limits of the previously reported ranges, but the number of teeth (= alveoli) present is also at or just above the lower limit recorded for other adults.

Many of the teeth showed extensive wear at the tip, particularly in the lower jaw, so that the occlusal surfaces were flattened. The maximum diameter of the five largest teeth in the upper and lower jaws (measured with dial calipers) averaged 6,3 and 6,6 mm respectively, while three of the relatively unworn teeth (all from the upper jaw) had overall dimensions (length × maximum diameter) of 8,8 × 5,8, 7,7 × 5,9 and 7,6 × 5,8 mm. The teeth of *P. electra* are, therefore, somewhat smaller than those of *F. attenuata*, where the five largest teeth in upper and lower jaws of two specimens averaged 21,2 × 6,8 mm (upper), 23,2 × 7,4 mm (lower), and 19,2 × 6,4 mm (upper), 22,0 × 8,0 mm (lower) (Nishiwaki *et al.* 1965).

The vertebral column of the Hout Bay specimen was composed of eighty-one vertebrae: previous vertebral counts for *P. electra* have been eighty-one (Bryden *et al.* 1977*a*, Goodwin 1945) and eighty-two (Nakajima & Nishiwaki 1965). Comparison of counts of vertebrae in different regions of the column with published data is impossible when the criteria used for distinguishing the regions are not specified (as indicated by De Smet 1977). Adopting De Smet's nomenclature, the vertebral formula of the Hout Bay specimen was as follows: Cv = (4) + 3, Th.v. = 12, I.Th.ℓ = 2, X = 18, Y = 31, Z = 11. Total = 81.

All epiphyses were fused to their centra, confirming the status of the animal as adult.

Vertebrae numbers 46 and 47 (the 7th and 8th of the caudal series) were partly fused together by their left transverse processes, clearly a pathological condition.

There were 14 thoracic ribs on the right side and 13 on the left, 6 of which on each side possessed a definite capitulum and tubercle. Each side of the 7th thoracic vertebra, however, possessed a spur 14 to 17 mm long on the ventral surface of the transverse process, while at similar positions on each side of the 8th thoracic vertebra there was a small protuberance. Similar structures were figured or described by Dawbin *et al.* (1970), also on the 7th and 8th thoracic vertebrae, and described as rib neck vestiges: in an animal from Australia these structures were present on the 8th, 9th and 10th thoracic vertebrae (Bryden *et al.* 1977*a*.) A 'spur' on the 7th thoracic was also described by Nakajima & Nishiwaki (1965). Vestigial catapophyses were present on the 6th to 11th thoracic vertebrae: Bryden *et al.* (1977*a*) found them on the 7th to 10th vertebrae.

The 5th rib on the left side of the thorax bore evidence of a healed fracture at a point about 40 per cent of its length from the capitulum.

Unlike *F. attenuata*, where the flippers normally contain four carpal bones (Best 1970), the Hiratsuka specimen of *P. electra* had five carpals in both flippers (Nakajima & Nishiwaki 1965). As determined by radiography, the Hout Bay specimen had five carpals in the right flipper and six in the left, the sixth being a small, almost circular element in contact with the cuneiform, hamate and fourth metacarpal bones.

The phalangeal formula was

Left I : 3, II : 8, III : 6, IV : 3, V : 2
Right I : 3, II : 8, III : 6, IV : 4, V : 2

The minute terminal phalanges on the 2nd to 5th digits shown in Nakajima & Nishiwaki's (1965) X-rays were (apart from R IV) absent. There was no indication of the bilateral asymmetry reported by Bryden *et al.* (1977*a*).

Despite Nakajima & Nishiwaki's (1965) contention that the phalangeal formula of *P. electra* resembled that of *F. attenuata*, there is some indication that the relative numbers of phalanges in digits II and III differ. In 21 flippers of *F. attenuata* examined by Nishiwaki *et al.* (1965), 76 per cent had a difference of only one phalange between digits II and III, and 24 per cent a difference of two phalanges. In both the Hiratsuka and Hout Bay specimens of *P. electra*, there was a difference of two phalanges between these digits, while Bryden *et al.* (1977*a*) gave the range for *P. electra* as 8–9 phalanges for digit II and 6–7 for digit III. This apparent difference between *P. electra* and *F. attenuata* may account for the difference in flipper shape mentioned above.

The sternum consisted of four elements, of which the most posterior was very small, as in the specimen examined by Nakajima & Nishiwaki (1965), but unlike their example all four elements were unfused. There were ten pairs of sternal ribs, as opposed to the nine found by Nakajima & Nishiwaki (1965).

DISCUSSION

Since Perrin (1976) summarized the known records of *P. electra*, and illustrated their distribution, there have been several additional published records. Caldwell *et al.* (1976) documented four specific records from the island of St Vincent in the southern Caribbean. Bryden *et al.* (1977*a*) described two specimens from Queensland and one from the Queensland–New South Wales border of Australia. A mass stranding of fifty-three individuals on Moreton Island, Queensland, was later described by Bryden *et al.* (1977*b*), and these authors also listed two previously unpublished records for the Australian region —an immature male stranded at Tweed Heads, New South Wales, in February 1967, and a sighting of a group of 100 off Stadbroke Island, Queensland, in May 1975. Miyazaki & Wada (1978) mentioned an animal of this species collected at sea in the western tropical Pacific. Perrin (1976) also omitted from his figure the record from Derby, Western Australia listed by Dawbin *et al.* (1970).

The nearest published records of the species to South Africa are an animal harpooned in mid-Atlantic at 03°03′N 24°40′W (Goodwin 1945) and a skeleton from the central Indian Ocean from Gan Island, Addu Atoll, Maldive Islands, at about 00°30′S 73°20′E (Dawbin *et al.* 1970). In addition, however, there are six skulls (one with an incomplete skeleton) of this species in the British Museum (Natural History) that were collected from stranded animals on the south side of Aldabra Atoll (09°20′S 46°25′E) near a place called Dune Jean Louis in September 1974. The catalogue numbers are 1980.147 to 1980.152 (M. C. Sheldrick *in litt.* 14 January 1980). The Hout Bay animal, therefore, represents not only the first record for South Africa but also the first record for the South Atlantic, and a major apparent range extension.

P. electra is usually considered to occur in tropical (Rice 1977) or tropical and subtropical waters (Van Bree & Cadenat 1968). Under this assumption the South African record, at 34°03′S and at the southern end of the cold Benguela Current system, may represent an animal at the probable extreme end of its range.

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